Remarks

A. Claims in the Case

Claims 1-23, 50, 76 and 97 are rejected. Claims 1, 16, and 50, 76 and 97 are amended. Claims 1-23, 50, 76 and 97 are pending in the case.

B. The Claims Are Definite Pursuant to 35 U.S.C. §112

Claims 1-24 are rejected under 35 U.S.C. §112, second paragraph as being indefinite for allegedly failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Regarding claim 1, The Office Action states:

> "... it is not clear which of the positively recited structures provides the intended function of 'the identity of the analyte is determined by the detection of the signal and the shape of the sensing element during use'. ... The claim is devoid of any positively recited structural element for determination and/or detection of 'shape' and/or analyte determination in view of the signal and shape." (Office Action, page 2, section 3, second full paragraph).

Applicant has amended claim 1 for clarification.

Applicant submits that the claims are definite pursuant to 35 U.S.C. §112. Applicant respectfully requests removal of the rejections of claims 1-24.

C. The Claims Are Novel Pursuant to 35 U.S.C. §102

Claim 50 is rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,557,900 granted to Heitzmann (hereinafter referred to as "Heitzmann"). Claims 76 and 97 are

rejected under 35 U.S.C. §102(b) as being anticipated by Japanese Patent No. JP 409105747 to Yamamoto (hereinafter referred to as "Yamamoto"). Claim 24 is rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,512,490 granted to Walt et al. (hereinafter referred to as "Walt"). Claim 97 is rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,051,388 granted to Bodenhamer (hereinafter referred to as "Bodenhamer"). Applicant respectfully disagrees with these rejections.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The Office Action asserts that Heitzmann teaches "forming a sensing element(s) having a predetermined shape (beads, 15; See column 4, line 64, to column 5, line 3 and column 6, lines 21-29). The sensing elements (15) are placed (blended) with a silicone pre-polymer (liquid composition) and cured to form a supporting member (matrix) (See column 6, lines 30-35)."

Applicant asserts that Heitzmann fails to teach, forming a plurality of sensing elements having different pre-determined shapes. Heitzmann appears to teach using commercially available hydrophilic porous beads or particles as sensing elements embedded within a hydrophobic matrix. Heitzmann states:

> As best seen in FIG. 3, each of the particles 15 has an outer surface 23 and interior voids 25 opening at the outer surface 23. An indicator 27 is carried in the voids 25. Because the particles 15 are hydrophilic and the matrix 13 is hydrophobic, the indicator 27, which is in an aqueous phase, tends to be retained within the voids 25 and/or on the outer surfaces 23 of the particles 15.
>
> Particles 15 of the type described above are commercially available. For example, polyacrylamide and agarose particles of the type described above are available from Bio-Rad of Richmond, Calif. as Bio-Gel P and Bio-Gel A, respectively, and cross-linked dextran beads are available from Pharmacia of Piscataway, N.J., as Sephadex. Such beads are generally spherical and may be obtained in various sizes.
>
> (Heitzmann, column 4, line 57-column 5, line 3).

Applicant submits that the particles or beads taught by Heitzmann do not anticipate the feature of forming sensing elements having different predetermined shapes. Applicant's specification recites:

> The supporting member may be made of any material capable of supporting the sensing elements. The sensing elements may have unique shapes, each of the shapes being associated with one or more analytes. For convenience the sensing elements are depicted have geometrical shapes, however it should be understood that the sensing element may have other shapes. The sensing elements may have a non-spherical shape. Lithographic techniques may be used to fabricate the sensing elements into shapes (Specification, page 11, lines 8-14).
>
> In one embodiment, a composition that includes polyethylene glycol (PEG) polymers is used for the fabrication of the sensing elements. Preferably, PEG hydrogel materials may be used. An advantage of using PEG hydrogel materials is that these materials exhibit general resistance to non-specific protein absorption and a wide variety of protein attachment protocols. Furthermore, the porosity of hydrogel materials may be varied to enable the transport of small analyte (e.g., glucose) and large analyte (e.g., protein) molecules for detection.
>
> The sensing elements may be formed using a variety of techniques. Generally, the sensing elements are formed from a composition which is subsequently cured. The curing may be conducted to impart a predefined shape to the sensing element. This shape may be used to identify the specific sensing element. Techniques that may be used to fabricate sensing elements include, but are not limited to, contact lithography, projection lithography, imprint lithography or micromolding based on surface wetting. (Specification, page 12, second-third full paragraphs).
>
> In a similar manner, projection lithography may be used to form the sensing elements. The method of projection lithography is similar to the method described above for contact lithography. Projection lithography differs from contact lithography in that the mask is not in contact with the underlying inert substrate, as depicted in FIGS. 2 and 3. Instead, the mask 210 may be positioned proximate to substrate 220, but not in contact with the substrate, as depicted in FIG. 4. Thus, the patterned light is projected onto composition 230. Substrate 220 may have coated or uncoated cavity 225 configured to receive the composition.

> In another embodiment, the sensing elements may be formed using micromolding. Referring to FIG. 5, the micromolding technique may be based on the formation of support 310 having a plurality of wells that may be used to form the sensing elements.
> (Specification, page 14, lines 18-30).

For at least the reasons stated above, Applicant submits that Heitzmann fails to teach or suggest the features of claim 50. Applicant respectfully requests the removal of the 35 U.S.C. §102(b) rejection against claim 50.

With regard to claim 76, the Office Action states that Yamamoto "discloses a method of sensing an analyte in a fluid that includes passing a fluid over a sensor array (1). The sensor array including at least one sensing element (120, 80, 60, 45, 30) coupled to a supporting element (2). The at least one sensing element has a predetermined shape (See Fig. 2). Spectroscopic changes in the sensing element are determined when contacted with a fluid containing an analyte and the shape of the sensing element is also determined." Applicant respectfully disagrees with this assertion. Claim 76 recites:

> A method of sensing an analyte in a fluid comprising:
> passing a fluid over a sensor array, the sensor array comprising at least one sensing element coupled to a supporting member, the sensing element having a predetermined shape;
> monitoring a spectroscopic change of the sensing element as the fluid is passed over the sensor array, wherein the spectroscopic change is caused by the interaction of the analyte with the sensing element; and
> determining the shape of the sensing element.

Applicant asserts that Yamamoto fails to teach or suggest at least the feature of monitoring a spectroscopic change of the sensing element as the fluid is passed over the sensor array, wherein the spectroscopic change is caused by the interaction of the analyte with the sensing element. Applicant's specification recites:

> The sensing element, in one embodiment, is capable of both binding the analyte(s) of interest and creating a detectable signal. In one embodiment,

> the sensing element will create an optical signal when bound to an analyte of interest. In one embodiment, a detectable signal may be caused by the altering of the physical properties of an indicator ligand bound to the receptor or the polymeric resin. In one embodiment, two different indicators are attached to a receptor or the polymeric resin. When an analyte is captured by the receptor, the physical distance between the two indicators may be altered such that a change in the spectroscopic properties of the indicators is produced. A variety of fluorescent and phosphorescent indicators may be used for this sensing scheme. This process, known as Forster energy transfer, is extremely sensitive to small changes in the distance between the indicator molecules
> (Specification, page 21, line 24-page 22, line 6).

Yamamoto appears to be drawn to a simplified urinalysis test strip system that is designed "[t]o make a detection result confirmable even by an unskilled person" and that relies on changes in the color of (differently shaped) detection parts after the strips are immersed in a urine sample. Yamamoto recites:

> On a plate-like support body 2 for a urine test paper 1, detection part 3-8 having a reagent according to inspection purpose carried by a medium such as paper or cloth are arranged in a row from the tip extended so as to be easily held. When a plurality of the detection parts having the same judgment time or the detection parts showing the same coloring or analogous coloring are present, the form of each part is mutually differed, for example, to be triangle or circle so as to be easily distriminatable (*sic*). When the color sample side is also made into the same form, the comparison can be surely performed to improve the measuring precision. Thus, an artificial error can be prevented regardless of the degree of skillfulness of a user.
> (Yamamoto, abstract).

Applicant asserts that Yamamoto's system does not appear include at least the feature of monitoring a spectroscopic change of the sensing element as the fluid is passed over the sensor array, wherein the spectroscopic change is caused by the interaction of the analyte with the sensing element. Instead, the urinalysis strips appear to be immersed in the urine sample and allowed to undergo an appropriate color change upon exposure to the analyte. The detection elements may then be compared with a standard color tone table, such as that which is depicted in FIG. 3, in order for test results to be rapidly and accurately read. Yamamoto recites:

> ... which is the test paper - ** with a pressure sensitive adhesive doudle (*sic*) coated tape, after dipping analysis tools ** in inspected liquid, such as urine, until it contrasts with samples, such as a standard color tone table.
> (Yamamoto, paragraph 16).

Applicant asserts that Yamamoto's system fails to teach or suggest the use of spectroscopy to monitor spectroscopic change is caused by the interaction of the analyte with the sensing element.

With regard to claim 97, the Office Action states that Yamamoto "discloses a sensor array (1) that includes a supporting member (2) and a plurality of sensing elements (120, 80, 60, 45, 30) coupled to the supporting member (2) wherein the sensing elements comprise a plurality of different shapes." Applicant respectfully disagrees with this rejection. However, in order to expedite the prosecution of this application, Applicant has amended claim 97. Amended claim 97 recites a combination of features that include:

> wherein the sensing elements are adapted to undergo a spectroscopic change when interacting with the analyte.

For at least the reasons cited above, Applicant submits that Yamamoto fails to teach or suggest the combined features of amended claim 97. Applicant asserts that Yamamoto teaches detecting elements that undergo color changes rather than spectroscopic changes.

For at least the reasons stated above, Applicant submits that Yamamoto fails to teach or suggest the features of claim 76 or amended claim 97. Applicant respectfully requests the removal of the 35 U.S.C. §102(b) rejections against claims 76 and 97.

Applicant has amended claim 1 to include at least some of the features of claim 24. With regard to claim 24, the Office Action states that Walt "discloses a system for detecting at least a

first and second analyte in a fluid ... the instantly claimed structure does not positively recite that the sensing elements are part of the claimed device. The instant claim language merely recites that the supporting member is configured 'to hold sensing elements' of the recited configuration. The supporting member disclosed by Walt et al. is capable of holding sensing elements as recited in the claim."

Claim 1, which was amended for the purpose of clarifying the scope of the claim, recites a combination of features that include:

> wherein a first portion of the sensing elements are configured to produce a signal in the presence of the first analyte and wherein a second portion of the sensing elements are configured to produce a signal in the presence of the second analyte, and wherein the first and second portions of the sensing elements have predetermined shapes, and wherein the shape of the first portion of sensing elements is different from the shape of the second portion of sensing elements.

As alluded to in the Office Action, Walt specifies no limitations on the geometrical configurations of thin film sensing receptor units that comprise the array. Walt recites:

> As shown by FIG. 1, the thin films for each sensing receptor unit 20, 30, 40, and 50 have been intentionally and somewhat artificially drawn to show differences in chemical formulation and constituents by geometrically different configurations. It is for this reason and this reason alone that sensing receptor units 20a and 20b are shaped as circles; sensing receptor units 30a and 30b are configured as hexagons; sensing receptor units 40a and 40b are trapezoids; and sensing receptor units 50a and 50b appear as triangles. In manufacturing tangible embodiments of these different sensing receptor units, however, it will be appreciated and understood that there is no restriction or limitation whatsoever regarding the true configuration, overall surface size, or actual placement of the different sensing receptor units on the supporting substrate. The artificial configurations for the different sensing receptor units shown in FIG. 1 are thus merely illustrative and for the benefit of the reader in order to be distinguish among the different sensing receptor units themselves. (Walt, column 9, line 56-column 10, line 8).

For at least these reasons, Applicant submits that Walt fails to teach or suggest the combined features of amended claim 1, including at least the features of wherein a first portion of the sensing elements are configured to produce a signal in the presence of the first analyte and wherein a second portion of the sensing elements are configured to produce a signal in the presence of the second analyte, and wherein the first and second portions of the sensing elements have predetermined shapes, and wherein the shape of the first portion of sensing elements is different from the shape of the second portion of sensing elements. Applicant respectfully requests the removal of the 35 U.S.C. §102(b) rejections against claim 1.

With regard to claim 97, the Office Action states "Bodenhamer discloses a sensor array that includes a supporting member (polyolefin film) and a plurality of sensing elements coupled to the supporting member wherein the sensing elements comprise a plurality of different shapes (See Figure 7). Applicant respectively disagrees with this rejection.

Applicant asserts that Bodenhamer fails to teach or suggest sensing elements coupled to the supporting member, wherein the sensing elements comprise a plurality of different shapes, wherein the sensing elements are adapted to undergo a spectroscopic change when interacting with the analyte. Bodenhamer appears to be directed to bioassay materials useful for the detection of toxic substances and to packaging materials for food and other products, along with methods for their manufacture and use.

Bodenhamer appears to teach capturing ligands, such as antibodies or chromogenic ligands, that are immobilized on a polymer film surface. The detector antibodies, which are the sensing elements of Bodenhamer that produce a colorimetric change, or, in the case of a photoactive detecting antibody, a visual cue in response to a particular type of light exposure, appear to be suspended within a colloid (e.g. agarose or other gel) matrix through which they are free to diffuse to and to bind to the analyte-bound capturing antibodies (See Bodenhamer, FIGS. 1, 4, 5 and 6). Bodenhamer recites:

> The capture antibodies are immobilized to the polymer film. An agarose gel coat containing detector antibodies is printed in register above the capture antibodies. A protective gel coat completes the construction of the packaging material. The gel coat constituting the inner layer, e.g. that layer which is next to the packaged product, is a special type of gel coat or an Equivalent thereto which has sufficient porosity to allow toxic molecules, known as antigens, to migrate through it to an antibody "sandwich" laminated between the polymer film and the gel coat. The special gel coat has sufficient abrasion resistance to prevent exposure of the reagents to the product. (Bodenhamer, column 5, lines 40-51).

For at least these reasons, Applicant submits that Bodenhamer fails to teach at least the features of sensing elements coupled to the supporting member, wherein the sensing elements comprise a plurality of different shapes, wherein the sensing elements are adapted to undergo a spectroscopic change when interacting with the analyte. Applicant respectfully requests the removal of the 35 U.S.C §102(e) rejection of claim 97.

For at least the reasons cited above, Applicants asserts that the claims are not anticipated by the cited art and are patentable pursuant to 35 U.S.C. §102. Applicant respectfully requests the removal of the rejections on these grounds.

D. <u>The Claims Are Not Obvious Pursuant to 35 U.S.C. §103</u>

Claims 1-7, 9 and 15 are rejected under 35 U.S.C §103(a) as being obvious over Yamamoto in view of U.S. Patent No. 5,408,535 granted to Howard, III et al. (hereinafter referred to as "Howard") and U.S. Patent No. 5,263,098 granted to Horikami (hereinafter referred to as "Horikami").

The Office Action asserts that Yamamoto teaches the features of claim 1, but does not teach a light source and a detector positioned such that light passes from the light source to the sensing elements and onto the detector during use. The Office Action further asserts that Howard teaches these features. Applicant respectfully disagrees with these rejections.

In order to reject a claim as obvious, the Examiner has the burden of establishing a *prima facie* case of obviousness. *In re Warner et al.*, 379 F.2d 1011, 154 USPQ 173, 177-178 (CCPA 1967). To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974), MPEP § 2143.03. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988), MPEP § 2143.03.

Amended claim 1 recites a combination of features that include:

> at least one sensing element, wherein the sensing element has a predefined shape, wherein the shape of the sensing element is associated with the analyte, and wherein the sensing element is configured to produce a signal when the sensing element interacts with the analyte during use; and
>
> a detector, the detector being configured to detect the signal produced by the interaction of the analyte with the sensing element during use;
>
> wherein the light source and detector are positioned such that light passes from the light source, to the sensing element, and onto the detector during use, and wherein detecting the analyte comprises detecting a signal from the sensing element.

Applicant asserts that neither Yamamoto nor Howard, taken alone or in combination, appear to teach or suggest at least the features of wherein the light source and detector are positioned such that light passes from the light source, to the sensing element, and onto the detector during use, and wherein detecting the analyte comprises detecting a signal from the sensing element. Applicant submits that there are no inherent or implicit teachings in Howard directed to the use of sensing elements of a predefined shape wherein the shape of the sensing element is associated with the analyte. Thus, there appears to be no implicit or inherent suggestion of the desirability of the claimed invention if persons of ordinary skill in the art combined the reference teachings of Howard and Yamamoto.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." 916 F.2d at 682, 16 USPQ2d at 1432.). See also *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992), MPEP §2143.01.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Moreover, as stated previously in Section C of this response, Yamamoto appears to be drawn to a simplified urinalysis test strip system that is designed "[t]o make a detection result confirmable even by an unskilled person" and that relies on changes in the color of (differently shaped) detection parts after the strips are immersed in a urine sample. Yamamoto's abstract recites:

> When the color sample side is also made into the same form, the comparison can be surely performed to improve the measuring precision. Thus, an artificial error can be prevented regardless of the degree of skillfulness of a user"

The system disclosed by Yamamoto thus appears to be particularly suited for use by even an unskilled user. Applicant asserts that "regardless of the degree of skillfulness of a user" implicitly includes use of the system by unskilled users. Applicant further asserts, that modifying

Yamamoto to include the teachings of Howard would render Yamamoto's invention unsatisfactory for its intended purpose since operation of the modified invention of Yamamoto would require specialized skill.

An obvious rejection based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, is not proper and the case of obviousness cannot be properly made. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984), MPEP 2143.01.

With regard to the assertion that Horikami teaches "that it is known in the art to employ image processing to determine the shape of an object present in a captured image", Applicant wishes to point out that the language "the identity of the analyte is determined by the detection of the signal and the shape of the sensing element" was removed during the course of amending the claim for the purpose of clarifying its scope in Section B of this response. Applicant submits, therefore, that Horikami no longer applies as a prior art reference against amended claim 1.

Applicant submits that, for at least the reasons cited above, claims 1-7, 9 and 15 are unobvious and patentable over the combination of references cited against the claims. Applicant therefore respectfully requests the withdrawal of the 35 USC §103(a) rejections against the claims.

Claims 8, 11-14, 17, 18 and 21-23 were rejected under 35 U.S.C. §103(a) as being obvious over Yamamoto in view of Howard, Horikami and further in view of U.S. Patent No. 6,066,448 granted to Wohlstadter et al (hereinafter referred to as "Wohlstadter"). The Office

Action states that Wohlstadter "discloses the use of a sensing array device (See Figures 5A and 5B) wherein each reagent zone includes different binding specificities (receptors) (See column 11, lines 12-55). Furthermore, the reference discloses a number of means in which to form the array of binding sites on the support member". Applicant respectfully disagrees with these rejections.

Applicant contends that, for at least the reasons cited above, neither Yamamoto, Howard nor Horikami, taken either alone or in combination, appear to teach or suggest all the limitations of independent claim 1 or any claims depending thereon. Applicant further contends that Wohlstadter, in the context of Yamamoto, Howard or Horikami, likewise does not appear to teach or suggest the limitations of the claims.

Applicant therefore submits that claims 8, 11-14, 17, 18 and 21-23 are unobvious and patentable over the combination of references cited against the claims. Applicant therefore respectfully requests the withdrawal of the 35 USC §103(a) rejections against the claims.

Claim 16 is rejected under 35 U.S.C. §103(a) as being obvious over Yamamoto in view of Howard, Horikami and further in view of U.S. Patent No. 6,379,969 granted to Mauze et al. (hereinafter referred to as "Mauze"). The Office Action states that Mauze discloses "that it is known in the art to provide a sensing element array in the form of a support member with sensing elements on the surface thereof (See Figure 2) or the support member can be a plate with the sensing elements within the wells." Applicant respectfully disagrees with this rejection.

Applicant has amended claim 16. Amended claim 16 recites a combination of features including at least the feature of "wherein the support member comprises at least one well." The amendment made to claim 16 was made solely for the purpose of correcting a typographical error and does not make any substantive change to the scope of the claim.

Applicant contends that, for at least the reasons cited above, neither Yamamoto, Howard

nor Horikami, taken either alone or in combination, appear to teach or suggest all the limitations of independent claim 1 or any claims depending thereon. Applicant therefore contends that Mauze, in the context of Yamamoto, Howard or Horikami, likewise does not appear to teach or suggest the limitations of the claim 16.

Applicant therefore submits that claim 16 is unobvious and patentable over the combination of references cited. Applicant therefore respectfully requests the withdrawal of the 35 USC §103(a) rejections against the claim 16.

Claims 10, 19 and 20 were rejected under 35 U.S.C. §103(a) as being obvious over Yamamoto in view of Howard, Horikami and Wohlstadter, and further in view of Walt. The Office Action states that Walt "discloses that when forming a sensing substrate as shown in Figure 1, it is known to employ polyethylene glycol polymer as a means for immobilization of the detection reagents". Applicant respectfully disagrees with these rejections.

Applicant contends that, for at least the reasons cited above, neither Yamamoto, Howard, Horikami nor Wohlstadter, taken either alone or in combination, appear to teach or suggest all the limitations of independent claim 1 or any claims depending thereon. Applicant therefore contends that Walt, in the context of Yamamoto, Howard, Horikami and Wohlstadter, likewise does not appear to teach or suggest the limitations of the claims.

Applicant therefore submits that claims 10, 19 and 20 are unobvious and patentable over the combination of references cited. Applicant therefore respectfully requests the withdrawal of the 35 USC §103(a) rejections against the claims.

E. SUMMARY

Based on the above, Applicant submits that the claims are now in condition for allowance. Favorable reconsideration is respectfully solicited.

Applicant hereby requests a three-month extension of time for this response. Applicant has attached herewith a Fee Authorization in the amount of $475 to cover the cost of Extension for response within third month. If any additional extensions of time are required, Applicant hereby requests the appropriate extension of time. Should any other fees be required, or if any fees have been overpaid, the Commissioner is authorized to appropriately charge or credit those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel Deposit Account No. 50-1505/5119-07301/EBM

Respectfully submitted,

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